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The Response of Sea Surface Topography to the 1976 El Niño

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ABSTRACT

The response of sea level in the equatorial Pacific Ocean during the 1976 El Niño event is analyzed and compared with the response during the stronger El Niño event in 1972. Monthly mean maps of sea surface topography illustrate the large horizontal scale of the internal wave associated with El Niño. Strong equatorial trade winds in 1975 increase sea level in the western Pacific. The relaxation of the wind in January 1976 allows an internal wave to form and proceed eastward, raising sea level along the eastern side of the ocean. This is followed by a year-long decline of sea level in the west, by an intensification of the North Equatorial Countercurrent and by a slackening of the South Equatorial Current. Strengthening of the winds in January 1977 terminates the 1976 event very rapidly. An estimate of the volume change of the warm upper layer gives a rate of $27 \times 10^{61} \text{ m}^3 \text{ s}^{-1}$ for the draining of warm water from the western Pacific Ocean over a one-year period. The 1976 El Niño event is concentrated predominantly north of the equator, in contrast to the 1972 event, and is terminated early by a renewed increase in the winds.

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